

Bonding Unit Practice Test

1. Which of the following ionic compounds has the largest lattice energy (the lattice energy most favorable to a stable lattice)?

- a) BaO
☒ b) BeO
 c) CsI
 d) NaBr
 e) BaS

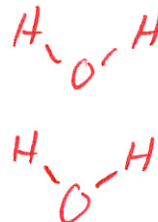
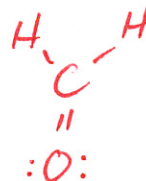
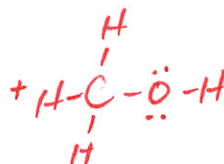
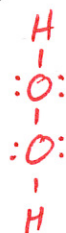
Tied for most charges (2+ and 2-) and smallest atoms.

2. Which of the following statements concerning lattice energy is *false*?

- a) It is often defined as the energy released when an ionic solid forms from its ions.
 b) MgO has a larger lattice energy than NaF.
☒ c) The lattice energy for a solid with 2+ and 2- ions should be two times that for a solid with 1+ and 1- ions.
 d) MgO has a larger lattice energy than LiF.
 e) All of these are true.

3. Given the following bond energies

C-C	347 kJ/mol
C=C	614 kJ/mol
C-O	358 kJ/mol
C=O	799 kJ/mol
C-H	413 kJ/mol
O-H	463 kJ/mol
O-O	146 kJ/mol



calculate ΔH for the reaction $\text{H}_2\text{O}_2 + \text{CH}_3\text{OH} \rightarrow \text{H}_2\text{CO} + 2\text{H}_2\text{O}$.

- ☒ a) -345 kJ
 b) -199 kJ
 c) -105 kJ
 d) +199 kJ
 e) +345 kJ

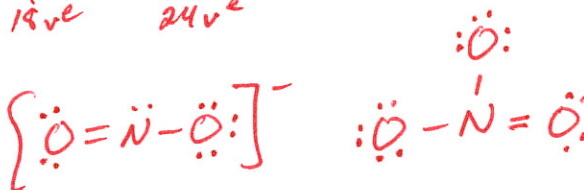
14ve⁻ 14ve⁻ 12ve⁻ 8ve⁻

$$\begin{array}{c} \text{H}_2\text{O}_2 \qquad \text{CH}_3\text{OH} \qquad \text{H}_2\text{CO} \qquad 2\text{H}_2\text{O} \\ \hline 2(463) + 146 + 3(413) + 358 + 463 - [2(413) + 799] - [4(463)] \\ \hline = -345 \text{ kJ} \end{array}$$

4. Which has the larger N-O bond length, NO_2^- or NO_3^- ?

- a) NO_2^-
 b) NO_3^-
☒ c) The bond lengths are the same.
 d) More information is needed.
 e) None of these (a-d)

18ve 24ve



5. Which of these is an isoelectronic series?

- a) $\text{Na}^+, \text{K}^+, \text{Rb}^+, \text{Cs}^+$
☒ b) $\text{K}^+, \text{Ca}^{2+}, \text{Ar}, \text{S}^{2-}$
 c) $\text{Na}^+, \text{Mg}^{2+}, \text{S}^{2-}, \text{Cl}^-$
 d) Li, Be, B, C
 e) none of these (a-d)

6. Which of the following has the smallest radius?
 a) Br^- b) S^{2-} c) Xe **d) Ca^{2+}** e) Kr

7. For the elements Cs, F, and Cl, the order of increasing electronegativity is:
 a) $\text{F} < \text{Cl} < \text{Cs}$
b) $\text{Cs} < \text{Cl} < \text{F}$
 c) $\text{Cl} < \text{Cs} < \text{F}$
 d) $\text{F} < \text{Cs} < \text{Cl}$
 e) None of these

8. Which of the following atoms cannot exceed the octet rule in a molecule?
a) N b) S c) P d) I
 e) All of the atoms (a-d) can exceed the octet rule.

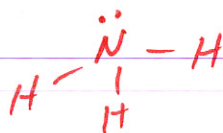
9. Atoms having greatly differing electronegativities are expected to form:
 a) no bonds
 b) polar covalent bonds
 c) nonpolar covalent bonds
d) ionic bonds
 e) covalent bonds

10. Which of the following groups contains no ionic compounds?
 a) HCN , NO_2 , $\text{Ca}(\text{NO}_3)_2$
 b) PCl_5 , LiBr , $\text{Zn}(\text{OH})_2$
 c) KOH , CCl_4 , SF_4
 d) NaH , CaF_2 , NaNH_2
e) CH_2O , H_2S , NH_3 — all non-metals

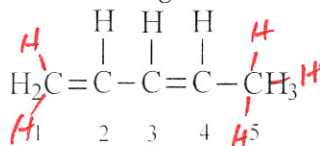
11. Choose the compound with the most ionic bond.
 a) LiCl **b) KF** c) NaCl d) LiF e) KCl

12. In the gaseous phase, which of the following diatomic molecules would be the least polar?
 a) CsF b) BeO **c) NO** d) FCl e) SO

13. Which of the following compounds contains only one unshared pair of valence electrons?
a) NH_3
 b) H_2O
 c) CH_4
 d) NaCl
 e) BeF_3



14–15. Given the following Lewis structure:

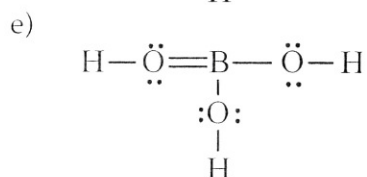
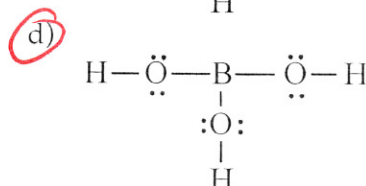
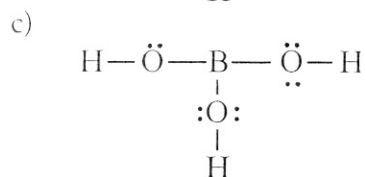
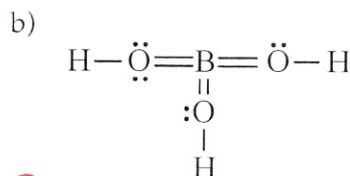
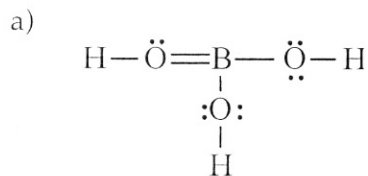


*every C has
4 bonds*

14. How many unshared pairs of electrons are present in this molecule?
a) 0 b) 1 c) 2 d) 3 e) 4

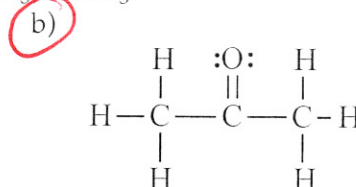
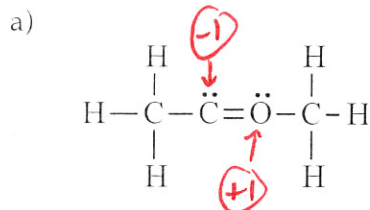
15. How many electrons are shared between carbons 1 and 2?
 a) 0 b) 2 **c) 4** d) 6 e) 8
double bond

16. The correct Lewis structure for H_3BO_3 is = 24 ve^-

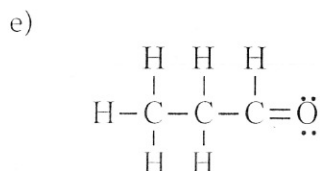
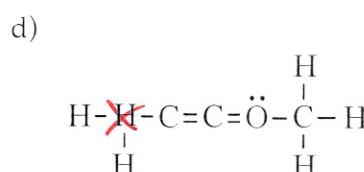
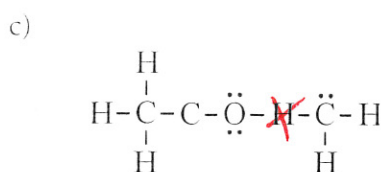


Boron does not obey the octet rule.

17. Select the best Lewis structure for acetone, CH_3COCH_3 .

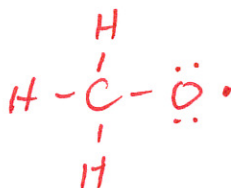


has zero formal charge



doesn't have the given structure

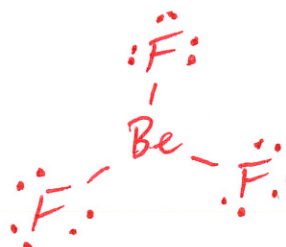
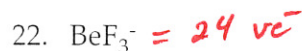
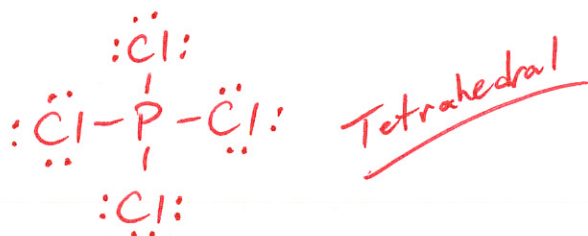
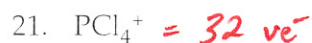
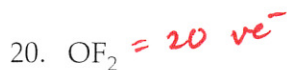
18. As indicated by Lewis structures, which of the following would probably not exist as a stable molecule?



Radicals are not very stable

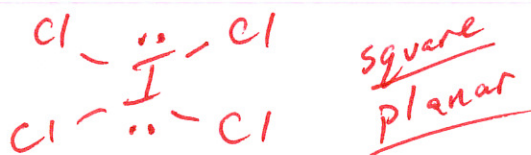
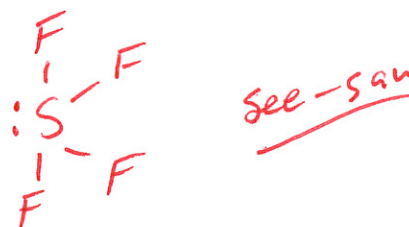
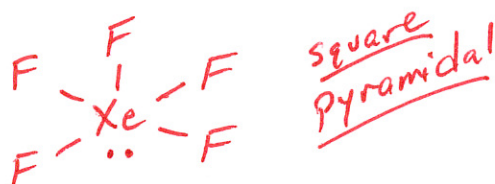
19-22. Select the correct molecular structure for the given species from the choices below:

- a) linear
- b) bent
- c) trigonal pyramidal
- d) trigonal planar
- e) tetrahedral



23-25. Select the correct molecular structure for the given species from the choices below:

- a) square planar
- b) see-saw
- c) square pyramidal
- d) trigonal bipyramidal
- e) octahedral

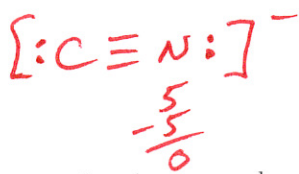


26. According to the VSEPR model, the bond angles in NH_3 and CH_4 are

- a) very different because one has a double bond and the other has all single bonds.
- b) very different because in each case there are a different number of electron pairs around the central atom.
- c) the same because both nitrogen and carbon are both in the second period.
- d) the same because in each case there are the same number of electron pairs around the central atom.
- ☒ e) slightly different because nitrogen's lone pair of electrons is more repulsive than carbon's bonded pair.

27. In the cyanide ion (CN^-), the nitrogen has a formal charge of

- a) -2
- b) -1
- ☒ c) 0
- d) +1
- e) +2



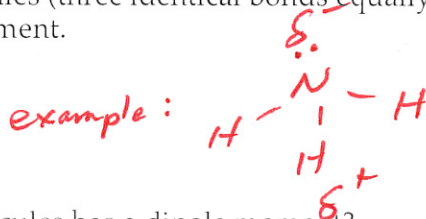
28. How many resonance structures can be drawn for the molecule O_3 ?

- a) 1
- ☒ b) 2
- c) 3
- d) 4
- e) 5



29. Which of the following types of molecules has a dipole moment (when polar bonds are present)?

- a) linear molecules with two identical bonds
- b) tetrahedral molecules (four identical bonds equally spaced)
- ☒ c) trigonal pyramidal molecules (three identical bonds)
- d) trigonal planar molecules (three identical bonds equally spaced)
- e) None has a dipole moment.



30. Which of the following molecules has a dipole moment?

- a) BCl_3 - trigonal planar
- b) SiCl_4 - tetrahedral
- c) ClF_5 - trigonal bipyramidal
- d) Cl_2 - no electronegativity difference
- ☒ e) none of these

31. For the molecule, Cl_2O :

- a) draw the Lewis structure
- b) give the shape of the molecule
- c) indicate the net polarity of the molecule

